Space Weather Technical Forecast

Issued on Thursday, 09 June 2022 at 13:21 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant space weather activity is expected.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low, with three C-class flares observed. Two of these are from AR3029 (Dro/Beta), a region close to the centre of the southern hemisphere. This is the re-emergence of the region with the same number, with a rapidly development of both visible and magnetic complexity. The circular nature of the region suggests underlying convection, with the region being closely monitored. The remaining C-class flare was from a region which is rotating across the northeast limb. This appears to be a return of persistent region ex-AR3014, which has produced significant activity on two previous rotations. A CME which left the northwest Sun late on 08 June is currently being analysed for a potential Earth-directed component.

Solar Wind / Geomagnetic Activity: The solar wind, observed by DSCOVR at L1 has been at ambient levels, currently averaging around 300km/s. Density has been around or just above average, with a slowly rising trend. Total interplanetary magnetic field strength has been weak at around 5nT, with the north-south component generally weakly negative. Phi angle was mainly negative, (towards the Sun) but intermittently positive between 08/1900 UTC and 09/0600 UTC. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at background levels. Electron flux (greater than 2MeV) was at background levels. Electron fluence has been well below the Active (1e8 integrated pfu) threshold with 1.33e6 integrated pfu recorded at 09/0000 UTC on a generally steady trend.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is expected to start mainly Low, but with an increasing risk of Moderate activity due to an evolving sunspot in centre disc, and returning regions on the eastern limb.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently forecast. The first of three weak coronal holes may connect with the Earth either late on day 1 or into day 2, but only slightly elevated winds are expected. Geomagnetic activity is forecast to be mainly Quiet with only a slight chance of Active either late on day 1 or into day 2 due to the potential coronal hole high speed stream connection.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10 MeV) is expected to be at background levels during this period. High energy electron flux (greater than 2 MeV) is expected to vary between background and perhaps moderate levels. Electron fluence is expected to remain below the Active threshold throughout, with a slight chance of an upward trend in fluence levels.

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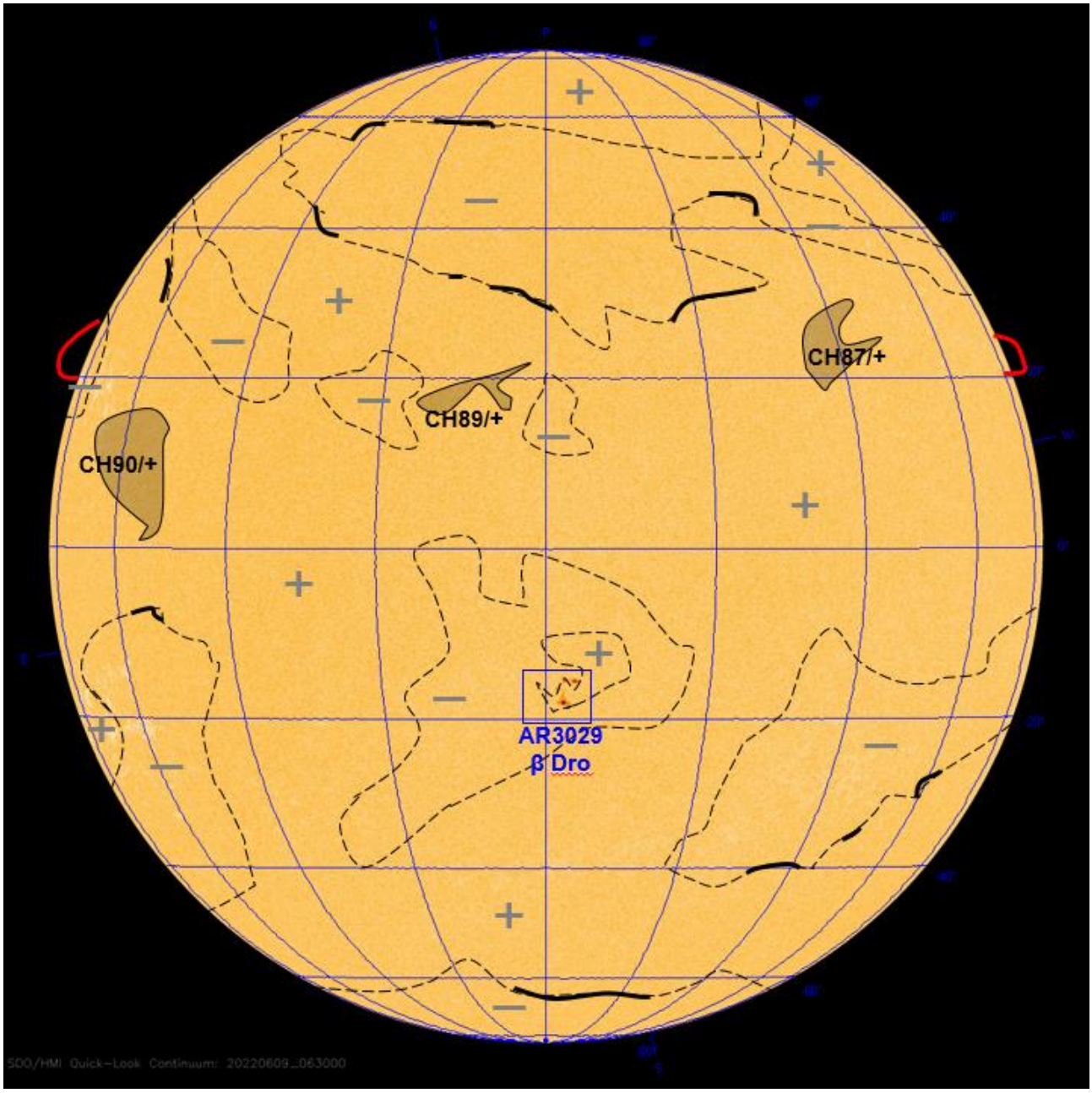
Figure 1. Solar Analysis Valid 09/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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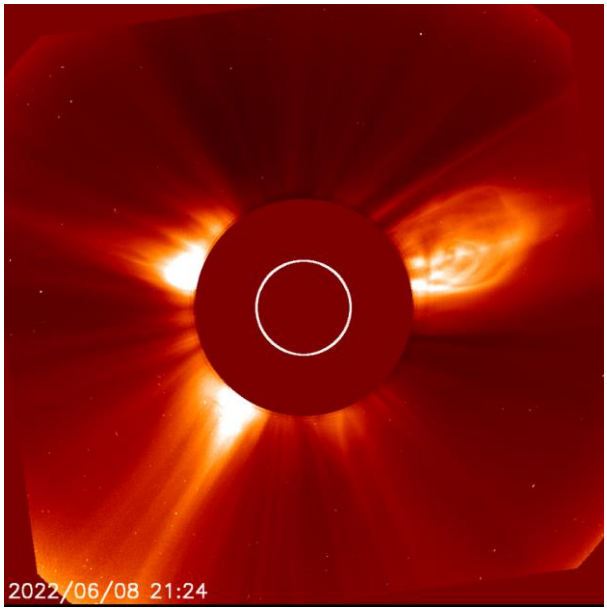
Geomagnetic Storms:
There are no Earth-directed CMEs forecast.

A CME which left the northwest quadrant of the Sun late on 08 June has been modelled and will be assessed for any Earth-directed component.
Solar winds are expected to be at mainly background levels through the forecast period. There is a possibility of a slight enhancement due to a high speed stream from coronal hole 87 either late on day 1 (09 June) or earlier on day 2 (10 June) with speeds up to 450km/s possible. Due to the proximity of the solstice, any connection is expected to be weak.

Geomagnetic activity is expected to be mainly Quiet, with a risk of isolated Active intervals either late on day 1 or early on day 2.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Filament eruption (top-right) currently being analysed for a potential Earth-directed component



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Radio Blackouts - X-Ray Flares:
There is currently one developing sunspot region on the visible disc. AR3029 (Dro/Beta) is evolving quickly, both visibly and magnetically, with an indication of potential gamma and delta characteristics. As the sunspot is near to the south-centre disc, the feature will be monitored closely for further developments. A region just beyond the northeast limb is also demonstrating signs of activity and is due to rotate across the northeast horizon in the next 24 hours.

Solar activity is forecast to be mainly Low, with an increasing risk of Moderate activity due both to the evolving region and the potential regions just beyond the eastern limb.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	5	10
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES 16 X-ray flux

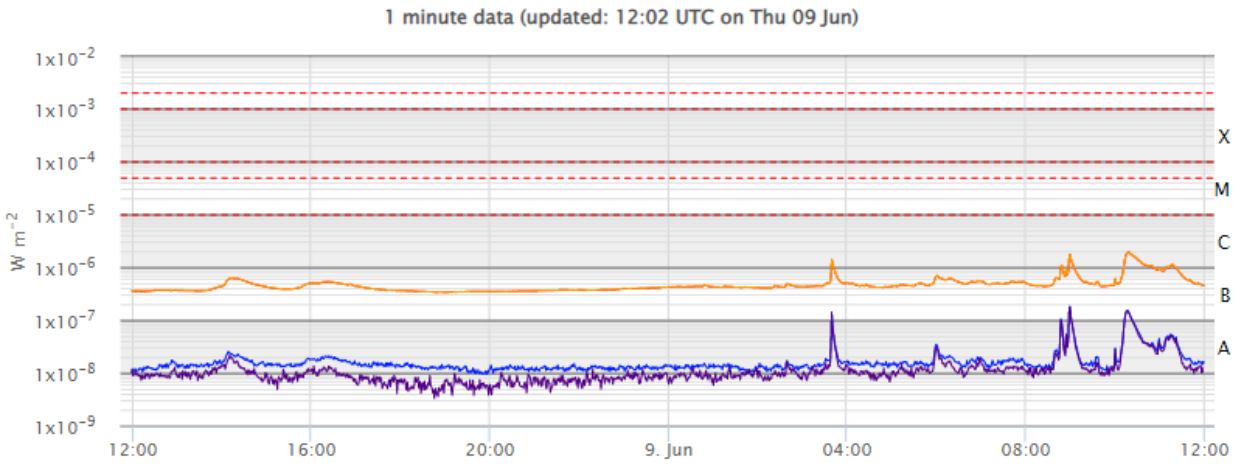

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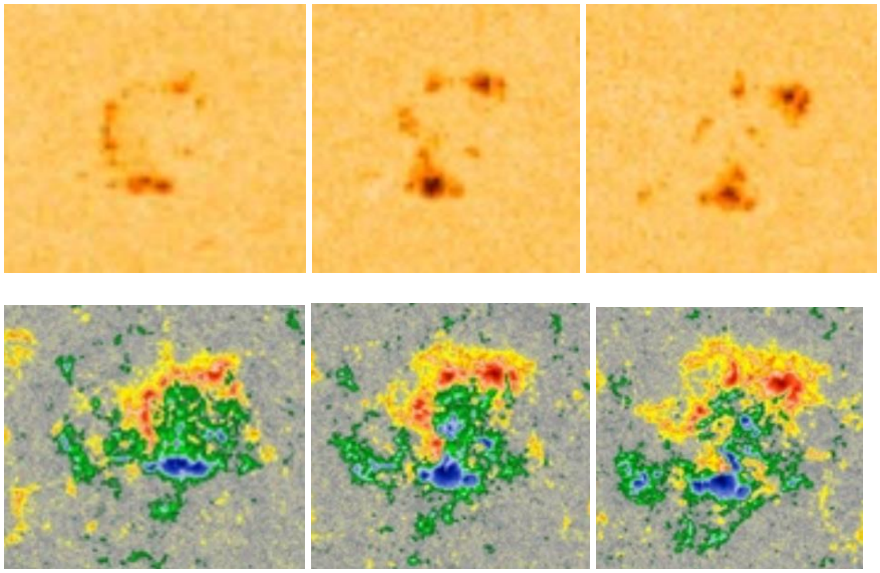
Figure 4: Development of AR3029 on HMI intensitygram and magnetogram for the last 24 hours

08/2300 UTC **09/0500 UTC** **09/1130 UTC**



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is at background levels. It is expected to remain at this level through the period in the absence of significant sunspot regions in the western hemisphere.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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High Energy Electrons Event (≥ 2MeV):
High energy electron flux (greater than 2MeV) is expected to remain at mainly background to moderate levels through the next four days. There may be a slightly rising trend in the diurnal peak during the period should the Earth connect with the weak coronal hole 87.

Corresponding electron fluence values are also expected to remain below the Active (1e8 integrated pfu) throughout, perhaps with a rising trend subject to the electron flux inputs.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^{8}$	No	1	1	5	10
Very Active	≥ 2 MeV ≥ $1x10^{9}$	No	1	1	1	1

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